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## CSC1010-Introduction

What is data? What is Information? Where do computers fit into the data and information world?

## CSC1010 - Introduction

### Computing?

This is the "introduction" to the Introduction of Computing. We explore the differences between data, knowledge, and information and their uses. There is a short exercise at the end of the module.

We all have this [end user computing](#) frustration.

There are [devices](#) that cause frustration.

We have [data input](#) that causes frustration.

And sometimes we want to [act out our frustration](#) on computers.

### Data, Information, & Knowledge

This is the "introduction" to the Introduction of Computing. We explore the differences between data, knowledge, and information and their uses. This is a short exercise at the end of the module.

What is data?

What is information?

What is knowledge?

The Distribution of Understanding



Diagram by RobOnKnowledge (Own work) [CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0>)], via Wikimedia Commons from Wikimedia Commons.

## What's the Difference?

- [One perspective](#) from Bob Boiko of the University of Washington (video)
- A more detailed [explanation](#)

## Information = Data + Context

- Group multiple pieces of data together
- Establish relationships between data items
- Provide context/framework for data
- Interpret resulting combination

## Validity of Information

- Valid Data -> Valid Information?
- Not necessarily!
  - What if the data is incomplete?

- What if the data is inaccurate?
- What if the context for the data is missing?
- If information is invalid, what happens to knowledge?

## **Where do computers fit in?**

- Computers store data.
- Computers process data
- Computers generate information

## **Data Processing Examples**

- Organize data
- Calculate new data
- Interpret data in a different format
- Spreadsheets
- Database management systems
- Accounting software
- Graphics manipulation programs

## **Visualisation as a Tool**

- David McCandless uses visualizations to turn large amounts of data into information.
- [Ted Talk 2010](#)
- [Data, Information, Knowledge, Wisdom](#)
  - Note his take on the diagram on page 3
- His [Information is Beautiful](#) website has many more examples of visualizations of data.

## Reflect and Investigate

1. Give your own example of valid data producing invalid information.
2. Explore the [Information is Beautiful](#) website and find a visualization, either in the blog or the Our Data section, that you think does a particularly good job of turning data into information. Why did you choose this particular item, and what makes it so good?

## CSC1010 – Chapter1 – History of Computing

### Before the Industrial Revolution

The Renaissance was a time of great philosophical and scientific progress, including critical milestones in mathematics that would lead toward the invention of the computer.

Boolean Algebra: This was published by George Boole in 1854. It clarified the mathematical field of Booldan logic and algebra. It formed the basis for computer hardware. For further details, please visit [George Boole's Contribution](#)

### Early Calculating Devices

These appeared approximately before 1820. The basic calculating devices were invented to support simple mathematics. This category of devices were mechanical in nature and could not store any data.

#### Abacus

- Invented about 3000 BC
- Originated in either China or the Indus River Valley area
- [Discussion of the abacus](#)
- [Demonstration of an abacus](#) (video)

#### Napier's Bones

- Device using lattice multiplication for calculating products and quotients
- Mechanical, but not mechanized
- [Napier's Bones: How They Work](#) (video)

#### Slide Rule

- Invented by William Oughtred in 1622
- Following up on Napier's work with both logarithms & Napier's Bones
- Performs a variety of mathematical calculations
- [How to Use a Slide Rule](#) (video)

### The Rechenuhr (Calculating Clock)

- First mechanical calculating device
- Built by Wilhelm Schickard in 1623
- Functioned accurately but had several mechanical flaws and was never placed into full production

### Pascaline

- Developed in 1643 by French mathematician Blaise Pascal
- Mechanical device that could add and subtract (in other words, a basic calculator)
- [Pascal and his Calculator](#)
- [How the Pascaline Works](#) (video)

### Von Leibnitz “[Stepped Reckoner](#)”

- Built in 1673 by German mathematician Gottfried Wilhelm von Leibnitz
  - Inventor of differential & integral calculus
- Calculating device improving on the Pascaline
- Could multiply as well as add and subtract (but still couldn't divide).

## The Industrial Revolution

The 1700s and early 1800s were a time of great political and social unrest (examples: the American and French Revolutions). As a result, mathematics and science took a back seat to other endeavors until the political and social climate settled down and the Industrial Revolution began early in the 19<sup>th</sup> century.

## 19<sup>th</sup> Century Computing Devices

- Products of the Industrial Revolution
  - Mechanical devices
  - Limited data storage
    - Small quantities
    - Clumsy methods
  - Design often outpaced available technology
- [19th century contributions to computing](#)

### Jacquard's Loom

- Invented by Joseph Jacquard between 1801-1804
- Built upon the work of Basile Bouchon, Jean Falcon and Jacques de Vaucanson to create an automatic weaving loom.
- Wove intricately patterned cloth based on instructions contained on punched cards.
- The first programmable stored instruction machine actually built.
- [Jacquard Loom: Early Computer Programing](#) (video)

### Charles Babbage

- [Charles Babbage](#) can be considered the single most important individual in the pre-20<sup>th</sup> century development of the computer.
- Lucasian Professor of Mathematics at Cambridge University
- Co-founder of the Royal Astronomical Society
- Cryptographer who broke Vignere's autokey cypher (thought to be unbreakable)
- Inventor of the locomotive cow-catcher

### Difference Engine

- Version 1: 1820-1830
- Solved polynomial equations of the form  $ax^2+bx+c$  to an accuracy of six places

- Gear-driven machine
- All calculating was done with repeated addition
- [Difference Engine Simulator](#)
- Prototype consisting of 1/7 of the final machine was built in 1832
- Remainder was never completed



**Note:**Image from the Science Museum via computerhistory.org

### Analytical Engine

- Designed 1833-1842
- Stored program machine to perform any type of arithmetic calculation
- Numerous limitations prevented Babbage from actually building it
  - Politics, economics, personalities were as much a factor as technology
- Comprised of three main parts
  - “Mill” for calculations

- “Store” for storing data
- Input/output device
- Design corresponds in many ways to the basic architecture of the modern computer
- Babbage [describes the Analytical Engine](#) in his autobiography
- Machine has not been built to this day
- [Plan28.org](#) Has been established to build the Analytical Engine by 2020
- Watch John Graham-Cunningham's TEDx talk on “[The Greatest Machine that Never Was](#)”

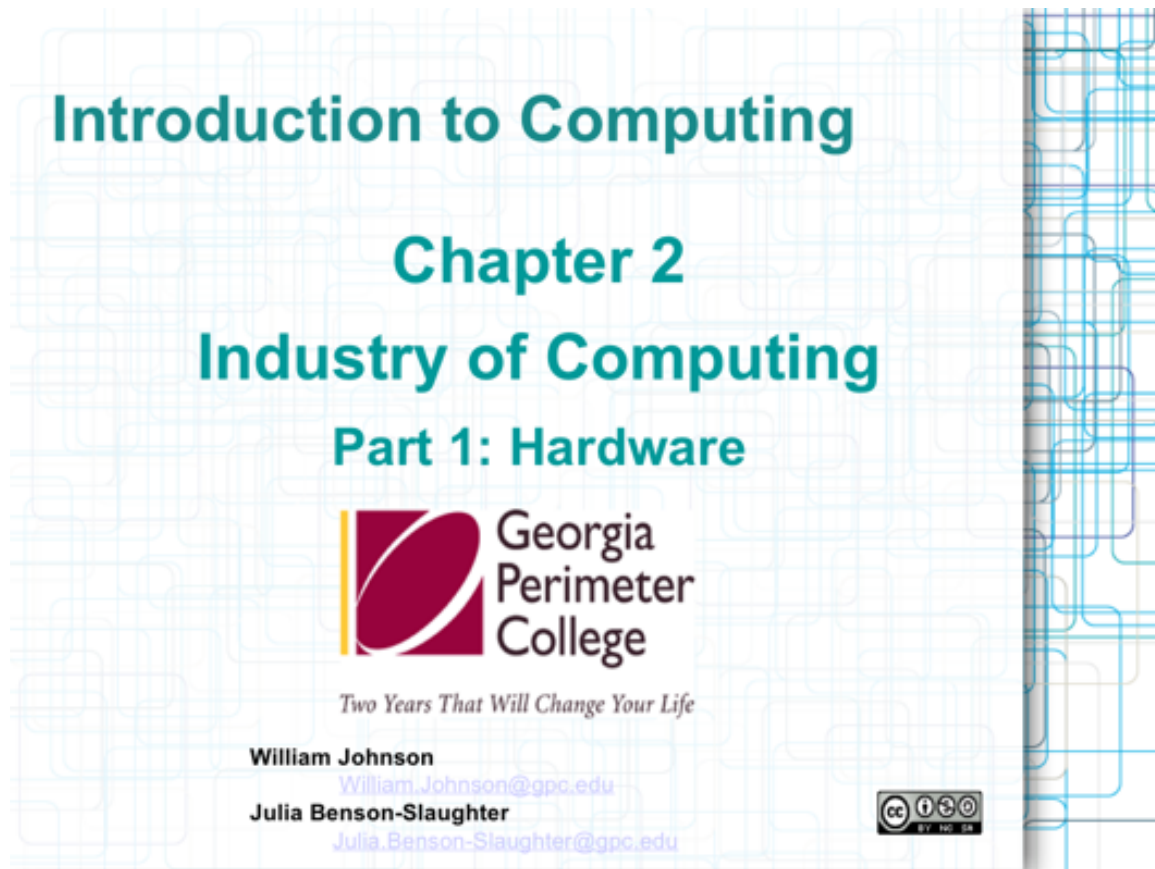
## Difference Engine #2

- Designed between 1847 and 1849
- Improved upon the original Difference Engine with a simpler design to achieve the same computing power
- Again, not built during Babbage's lifetime
- [Was finally built](#) between 1985 and 2002 by the Science Museum of London, exactly to Babbage's original plans

CSC1010-Chapter-2-1

## CSC1010 - Chapter 2-1

### Industry of Computing




**Introduction to Computing**

**Chapter 2**

**Industry of Computing**


**Part 1: Hardware**

 **Georgia  
Perimeter  
College**

*Two Years That Will Change Your Life*

**William Johnson**  
[William.Johnson@gpc.edu](mailto:William.Johnson@gpc.edu)

**Julia Benson-Slaughter**  
[Julia.Benson-Slaughter@gpc.edu](mailto:Julia.Benson-Slaughter@gpc.edu)



## Chapter 2

# Industry of Computing

- This chapter covers computer hardware. The internal storage, external storage, and items connected to a computer. Also, binary is explained and digital media is examined.
- Next, we discuss software and the various categories, what software is appropriate for business and personal usage.
- Then we discuss the service sectors related to computing and how important they are to the IT world.
- Finally, we look into various jobs related to the computing industry.

# Industry of Computing

- **Hardware**

- Data
- Software
- Services
- Jobs

# Computer Hardware

- Hardware Basics
  - What is a computer?
  - Let's look under the hood.
  - What is connected to a computer?
  - Securing your computer.

# Overview

- [Computer Basics](#) (video)
- [Computers: A Chronological Timeline](#) (infographic)
- [Make Use Of's Your PC Inside & Out, Part 1](#)
- [Make Use Of's Your PC Inside & Out, Part 2](#)
- [What's Inside Your Computer: The Story Of Every Component You Need To Know](#)

# What is a Computer?

- ANY digital device that can operate various applications.
- A device's physical appearance is called its form factor.

# Form Factor Examples

- Desktop



- Laptop



- Smartphone



- Tablet



- Wristwatch



- Automobile



# A Look Under the Hood

- Major computer components
  - CPU
  - Data Storage
  - Input/output devices
  - Other peripheral devices
- Collectively known as the von Neumann Architecture

# The CPU

- The “brains” of a computer
- Carries out all basic functions
  - Calculations, including computations & comparisons
  - Control of other components
  - Coordination of all functions
- [What Is A CPU and What Does It Do?](#)

# The CPU

- The “brains” of a computer
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- [What Is A CPU and What Does It Do?](#)

# CPU architecture type

- Determined primarily by instruction set
  - Basic commands programmed into the CPU
  - Everything a computer does is described using only these instructions
- CISC - Complex Instruction Set Computer
  - Large number of relatively complex instructions
  - Individual instructions may be time-consuming
  - Fewer instructions needed to carry out a task
- RISC - Reduced Instruction Set Computer
  - Relatively small number of very simple instructions
  - Individual instructions execute very quickly
  - A task requires a long series of instructions

# Differences Between CPUs

- Instruction set
  - Each CPU uses only its own instruction set
  - This is one reason why programs written for one type of machine don't work on another type
- Data size that the CPU can handle
  - Determines how large or precise the values are that the computer can use
  - Influences the number and complexity of available instructions
  - [What Is 64-bit Computing?](#)
- Clock speed
  - Determines how fast individual instructions execute
  - Determines how frequently the system is synchronized
- Number of "cores" in the CPU
  - [What Does "Dual Core" & "Quad Core" Mean?](#)

# CPU Clock

- Embedded inside CPU
- Synchronizes and controls performance of entire system
  - Expressed in cycles per second or in hertz, where 1 hertz = 1 on/off cycle
  - Typical CPU speeds are expressed in megahertz (MHz) or gigahertz (GHz)

## CPU and Performance

- CPU speed is not sole determining factor in system performance.
- Instructions execute faster than data can be transferred to/from memory.
- Memory access speed, data bus speed, secondary storage access speed all heavily impact computer performance

# CPU/Integrated Circuit Resources

- [Evolution of the CPU](#) (infographic)
- [Development of the Transistor](#) (video)
- [The Fabrication of the Integrated Circuit](#) (video)
- [How 22nm Computer Chips Are Made](#) (video)

# Memory

- The “brawn” or muscle of a computer depends on speed and size of storage.
- Memory comes in several types with different characteristics for different purposes
- [An Overview of PC Memory Types](#) (video)

# Memory Size

- Size is measured in bytes
  - 1 bit = smallest possible unit of data in a computer, with a value of either 0 or 1
  - 1 byte = 8 bits
- Actual memory sizes are quite large
  - 1 kilobyte (kb) = 1024 bytes
  - 1 megabyte (mb)= 1024 kilobytes
  - 1 gigabyte (gb) = 1024 megabytes
  - 1 terabyte (tb) = 1024 gigabytes

# RAM

- Short for Random Access Memory
- Electrically based, requires power to work
- Holds active (currently executing) programs and data
- Loses current information when it loses power
- FSB (front side bus)
  - Moves data between memory and the CPU.
  - Speed determines how quickly CPU can begin next instruction

# RAM

- [RAM form factor evolution chart \(Infographic\)](#)
  - RAM boards have
    - different amounts of memory
    - different sized boards holding the chips
    - different pin connector numbers/configurations
    - different access speeds
  - Each type of computing device uses a specific type of RAM
  - RAM for one computing device is not likely to fit another

# Specialized RAM

- High speed compared to standard RAM
- Cost limits its use to certain functions
  - CPU Registers – hold the current instruction
  - Cache – acts as a buffer between CPU and standard RAM
    - L1 – built in to the CPU, runs at CPU speed
    - L2 – separate chip, larger and slower
    - L3 – additional buffer to supplement L2 cache

# ROM, EEPROM

- Holds values with/without electrical charge
- Contains starting or “initializing” steps to start the computer
  - Hardware tests
  - Permanent location of operating system
- True ROM is read-only, cannot be changed
- EEPROM is electrically programmable (changeable) IF you have the right equipment
- [How ROM Works](#)

# Instruction Processing

- Serial
  - One instruction executes at a time
  - CPU must completely finish with one instruction before starting on the next one
- Pipelining
  - While one instruction is executing, the next instruction is loading from memory into the CPU.
- Parallel
  - Multiple instructions can execute simultaneously dramatically increasing the speed.

# The Motherboard

- Integrated circuit board forming the physical foundation for personal/handheld computers
- Contains
  - CPU
  - ROM/EEPROM
  - RAM/cache memory
  - Connectors for attaching mass storage devices
  - Connectors for attaching input/output and other peripheral devices

# The Motherboard

- [Motherboard Parts & Functions](#) (video)
- [How a Motherboard is Made](#) (video)

## Secondary storage

- Also called mass storage or auxiliary storage
- Used for “permanent” data storage
  - [The Lifespan of Storage Media](#) (infographic)
- Non-volatile, retains its information without electrical power available
- May be permanently installed or removable, portable or fixed location
- [The History of Digital Storage](#) (infographic)

# Types of Secondary Storage

- Hard Disk Drive
  - [How Hard Drives Work](#) (reading)
  - [Inside a Hard Drive](#) (video)
  - [Data Size Matters](#) (infographic)
- DVD R/W
- Flash (USB) Drive and SD Card
- [The Cost of Data Storage](#) (infographic)

## Graphics “extras”

- GPU (Graphics Processing Unit)
  - Allows computer to handle output of data to monitor separately from normal operation
- HDMI support

# Input devices

- Gather external data, convert to electronic binary format, and store in RAM
- [The Human Computer Interface](#) (infographic)
- Examples:
  - Keyboard & mouse
  - BD (blue-ray drive)
  - Game controller
  - Scanner
  - Web cam/digital camera

# Output devices

- Take binary data from RAM, convert to human-useable format and make it available to the user
  - Monitor
    - [The Technology of Touch Screens](#) (infographic)
  - Printer
    - Laser
    - Inkjet
    - Specialty
  - Speakers

# SUMMARY

- Computer hardware:
  - internal storage
  - external storage
  - Peripherals
  - Binary is the language of computing
  - Digital media

## CSC1010 – Chapter-2-2

### Industry of Computing

# Industry of Computing

- Basics of Software
- Piracy and Copyrights
- Two Main Categories
  - System software
  - Application software
- Installation and Updates
- Security (Anti-virus)

## Basics of Software

- It is only one's and zero's.
- How is software represented inside a computer?
- What does the computer do when numbers are entered?
- Binary is the language of any computer.

## Basics of Software

- Binary can represent anything that can be stored inside a computer.
- A number system not unlike decimal
- Compare to decimal (0-9)
  - Start at 0 ( $0 = 00 = 000 = \dots$ )
  - What to do for ten?
    - Increase adjacent left digit by one, start right digit over with 0
    - 10, 11, 12, ..., 19, 20, 21, 22, ..., 29, 30, 31, 32, ...
    - Increase next adjacent left digit by one 100, 101, 102, ..., 109, 110...

# Basics of Software

- **Base ten:**

- Uses 10 digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
- Each place corresponds to a power of 10
- $1,976 = 1 \times 10^3 + 9 \times 10^2 + 7 \times 10^1 + 6 \times 10^0$

- **Base two:**

- Uses 2 digits: 0, 1
- Each place corresponds to a power of 2
- $1101 = 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 = 13$

# Basics of Software

- Buy or Use What Comes With the Computer?
  - WordPad versus Microsoft Word
  - Windows defender versus Symantec
- Buy or Download Free (or Almost Free)?
- What is a User License?

# Basics of Software

- Evaluate Needs and Cost of Software.
  - Is there already an app for that?
- Ensure Your Computer Will “work with” the new Software.
  - Check requirements and your system's configuration

## Basics of Software

- Commercial Software – Buy Online or in a Retail Store.
- ShareWare Software – Try it Before You Buy it.
- DemoWare – Trial Version that Expires.
  - May be limited in functions/features
  - Could have limited time for running
  - Might be capped at how many times you run the demoware
  - Usually hard to remove after trial is over
  - Includes a “nagging” feature to buy it

# Basics of Software

- OpenSource is Free From Cost
  - Will include (most times) the source code
  - Can be modified by an individual
  - Usually licensed “not for resale”
- FreeWare is Free from Cost but...
  - Will not include source code
  - Can copy, distribute freely
  - Cannot be modified or resold

# Basics of Software

- User License has Many Formats
  - Single user
  - Multiple user
  - Site license
  - Shrink wrap license
- End User License Agreement (EULA)
- Public Domain Software
- Creative Commons Licensing

# Basics of Software

<http://www.youtube.com/watch?v=seSEEj4JBqE>

- Piracy is Real
- Copyrights Protect Many Things
- Signs of Pirated Software
  - Packaging (poor graphics, hand written)
  - Marked differently (OEM, Academic, NFR)
  - Multiple software systems on a single DVD
  - Photocopied user manual

# System Software

- Operating system
  - Master controller for computer hardware
  - Allows you to interact with hardware
- Utilities
  - Monitor health of computer
  - Prevents most BSOD
  - Protects against viruses
  - Keeps data safely stored

# System Software

- Operating system – how many out there?
  - UNIX (Linux, Ubuntu)
  - Windows
  - Mac OS
  - IOS
  - Android
  - Chrome (UNIX variant)
  - FireFox (under development)

# System Software

- Operating system – boot process
  - Starts when power is turned on
  - Read ROM for master instructions
  - Begin to execute (run) these instructions
  - Read secondary storage (C Drive)
  - Load Operating System files into RAM (main memory) and execute instructions

# Security Software

- Protects your computer against viruses:
  - Worms
  - Bots (zombie takeover)
  - Trojan Horses
  - Spyware
- How do you know if you're infected?
  - System slow down
  - Lots of popups
  - Slow startup
  - Current security software is disabled

# Security Software

- Antivirus Software (utility software)
  - Purchase from the web (some are free)
  - Office supply stores
  - Electronics and computer stores
- How does it detect a virus?
  - Virus signature (patterns in a file)
  - Keep updates current
  - Perform a weekly scan on your entire system

# Application Software

- Productivity
- Financial
- Entertainment
- Web Apps
- Portable / Mobile Apps

# Application Software

- Productivity Components
  - Word Processor
  - Spreadsheet, calculations, and formulas
  - Presentation software
  - Database software
- Examples
  - Microsoft Office (Commercial)
  - OpenOffice (Open Source)
  - LibreOffice (Open Source)
  - Others?

## Classroom Activity

- In class activity and finish as homework.
- Install portable “Open Office” to a flash drive. (Windows only.)
  - Found here:  
[http://portableapps.com/apps/office/openoffice\\_portable](http://portableapps.com/apps/office/openoffice_portable)
- Compare and contrast the word processor, spreadsheet, and presentation software (powerpoint).
- Write a paragraph on each of the three.

# Industry of Computing

- Hardware
- Software
- **Services**
- Jobs

# Services

- Computer Services are actions performed that are related to computer hardware, software, Internet access, cloud computing, telecom, e-commerce, and electronics.
- How do you get your PC repaired?
- Where do you buy Software?
- Who connects you to the Internet?

# Services

“My computer is broken and I can't boot up.”

- PC repair service companies / individuals
  - Remove viruses / check
  - “tune up” your computer
  - Install upgrades
  - Install new application software

# Services

“My Network is not working with the Internet.”

- Internet Service Providers
  - Troubleshoot network connections
  - Configure security for a firewall
  - Setup remote “VPN” connectivity

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# Industry of Computing

- Hardware
- Software
- Services
- **Jobs**

# Industry of Computing

- The work you choose will be computer or IT centric.
- Some degree or industry certification will be required.
  - Microsoft Certified Professional
  - Cisco CCNA certifications
  - Comp TIA+ (vendor neutral)
  - Associates degree in CS or BIS
  - Undergraduate degree in CS or BIS
  - Some sort of work experience in the field

# Industry of Computing

- Resources for finding jobs:
  - [www.monster.com](http://www.monster.com)
  - [www.computerjobs.com](http://www.computerjobs.com)
  - [www.usajob.gov](http://www.usajob.gov)
  - [www.careers.yahoo.com](http://www.careers.yahoo.com)
  - [www.techjobs.com](http://www.techjobs.com)
  - Others??

# Homework Assignment

- Interview someone that works in the computer industry.
- Ask questions related to:
  - What types of computers are used?
  - Are there databases and if so, what kind (manufacture)?
  - How many "IT" people work there?
  - What kind of degree(s) does the person have?
  - Any productivity software used.
  - Any vertical market software used.

# SUMMARY

- Computer hardware:
  - internal storage
  - external storage
  - Peripherals
  - Binary is the language of computing
  - Digital media
- Computer software:
  - Represented in binary
  - System
  - Application
  - Productivity
  - Horizontal

# SUMMARY

- Computer services:
  - IT
  - Personal
  - Big Business
- Computer Jobs:
  - System
  - Application
  - Productivity
  - Horizontal

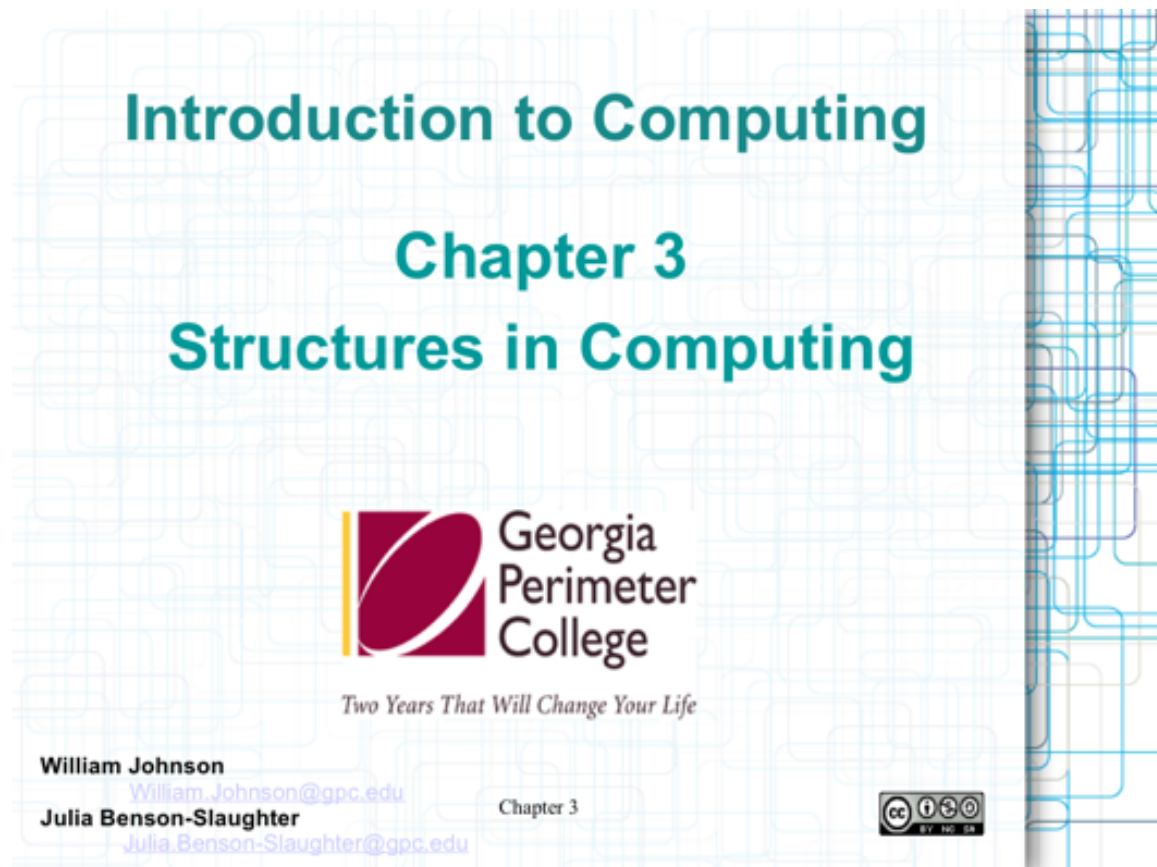
# Resources

- <http://www.yevol.com/en/vcsharp/applicationdesign/lesson10.htm>
- <http://hephaestusaudio.com/delphi/2009/07/>
- <http://www.thestudentroom.co.uk/showthread.php?t=2514471>

Chapter-3-1

## CSC1010 – Introduction to Computing

### Structures in Computing



## Chapter 3

# Structures in Computing

- **This chapter covers computer networks. The various sizes and configurations are examined and we explore where they are used.**
- **Next, we discuss the Internet and its various aspects. The basics of the Internet, how it moves information, and how it has changed our everyday life.**
- Then we discuss the Cloud. This topic reveals how the Cloud is structured, what factors are related to using it, and future possibilities
- Lastly, we explore the new world of Socialnomics in computing.

# Structures in Computing

- **Networks**

- The Internet
- The Cloud
- Socialnomics

Chapter 3

**Networks**

**Internet**

**Cloud**

**Socialnomics**

# Structures in Computing: Networks

- Sizes and types of networks.
- Protocols
- Bandwidth is all about speed.
- Topologies of networks.
- Appropriate usage of a network.
- Security

[https://www.youtube.com/watch?v=ueVnSz\\_IXEs](https://www.youtube.com/watch?v=ueVnSz_IXEs)

Chapter 3

**Networks**

**Internet**

**Cloud**

**Social-nomics**

# Structures in Computing: Networks

Sizes and types of networks.

- WPAN (wireless personal area network)
  - Headphones, Car, Speakers, TV (one device to one device)
- LAN (local area network)
- MAN (metro area network)
- WAN (wide area network)
- IAN (NASA's Curiosity Rover tweets from Mars)

Chapter 3

Networks

Internet

Cloud

Social-nomics

# Structures in Computing: Networks

How does a network connect?

- Wireless
  - Radio Frequency
  - Microwave
  - Bluetooth
  - NFC, 3G, 4GLTE
- Wired
  - Ethernet cable: CAT5, RJ45 connector
  - Speeds: 10Mbps, 100Mbps, 1000Mbps
  - Fiber Optic: 2.5Gbps (100KM), 14Tbps (160KM)

Chapter 3

Networks

Internet

Cloud

Social-nomics

# Structures in Computing: Networks

What about standards?

- IEEE (International Electronics and Electrical Engineers)
- What is a network protocol?
  - Standards for sending and receiving data:
    - WiFi
    - Wired
    - Bluetooth
    - NFC/ANT+
    - RFID
    - Infrared light

<http://standards.ieee.org/about/csl/802/802.15.html>

Chapter 3

Networks

Internet

Cloud

Socialnomics

# Structures in Computing: Networks

What about devices that make a network?

- Node
- Router
- Bridge
- Switch
- Repeater

Chapter 3

Networks

Internet

Cloud

Socialnomics

# Structures in Computing: Networks

**Node:** Any physical device connected to a network.

- PC, Laptop
- Smart phone, pad
- Printer / Scanner
- Network attached storage
- Router
- Gaming device
- Internet TV / Streaming Media device

Chapter 3

Networks

Internet

Cloud

Social-nomics

# Structures in Computing: Networks

## Gateway versus Router

- Gateway:
- Translates one network language into another.
- In stand-alone, not requiring another "modem" to connect to the Internet
- Think of cable TV translating to the Internet communication

### Router:

- Keeps data not intended for your network, out of your network.
- Keeps data in your network from leaking out to the Internet.
- Lets you segment your network into smaller pieces.
- Think of small networks at each GPC campus creating one large GPC network for the whole college.

Chapter 3

Networks

Internet

Cloud

Social-nomics

# Structures in Computing: Networks

## In Class Activity: Configure a Router

Do the following: (take screen shots of each of these and put into Word document.)

- 1) Set the wireless SSID to your firstname.lastname
- 2) Set wireless security to "WPA2 Personal" with "TKIP & AES" and set the shared key to be your lastname-GPCID-firstname.
- 3) Set the "traceroute" (under Administration-Diagnostics) to "www.gpc.edu"
- 4) Enable the log and show "Incoming Log Table"
- 5) Setup-Advanced Routing; show "routing table"

<http://ui.linksys.com/WRT54GL/4.30.0/Setup.htm>

Chapter 3

Networks

Internet

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# Structures in Computing: Networks

## Bridge:

- A device that filters data traffic at a network boundary.
- Bridges reduce the amount of traffic on a LAN by dividing it into two segments.

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# Structures in Computing: Networks

## Switch:

- A network switch is a small hardware device that joins multiple computers together within one local area network (LAN).
- Broadband routers integrate Ethernet switches directly into the unit as one of their many functions.
- High-performance network switches are still widely used in corporate networks and data centers.

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# Structures in Computing: Networks

## Repeater

- Network repeaters regenerate incoming electrical, wireless or optical signals.
- Repeaters attempt to preserve signal integrity and extend the distance over which data can safely travel.
- Active hubs are sometimes also called "multiport repeaters," but more commonly they are just "hubs."

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Networks

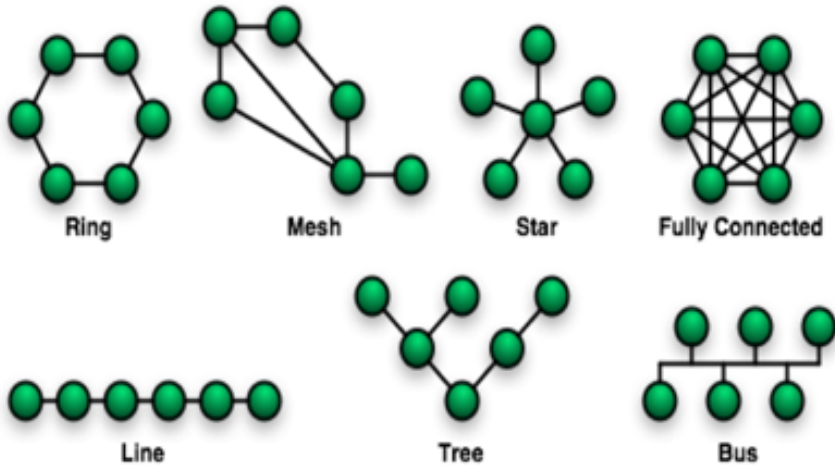
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# Structures in Computing: Networks

- Topologies of networks:



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# Structures in Computing: Networks

- In Class Activity and Homework (to finish)

Open the Concepts Lab, located at

<http://www.mtcboj.com/pub/np2014/comp/content/al05a.htm>

Work through the lab.

Take a screenshot of the final screen showing your Lab Quickcheck Results and paste it into a Microsoft Office Word document.

Submit the Microsoft Office Word document in iCollege.

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# Structures in Computing: Internet

- Internet Technology
- Stationary Internet Access
- Portable Internet Access
- What are Internet Services?
- Is the Internet secure?

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# Structures in Computing: Internet Technology

- History (Where did it start?)
- How is it structured? (Description of Infrastructure.)
- How does it communicate? (Protocols, Domains, Addresses)
- How fast can it go? (Upstream, Downstream)
- Can it go any faster? (Bandwidth)

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# Structures in Computing: Internet Technology

- Created in 1969, Connected four universities: University of CA at Santa Barbara (UCSB), University of Utah, Stanford Research Institute (SRI), and University of CA at Los Angeles (UCLA).
- Created as the "Advanced Research Projects Agency Computer Network" or ARPANET.
- Later becomes the "Internet"
- An unplanned usage created the first "email" in 1971 as a text data file sent between two researchers.



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# Structures in Computing: Internet Technology

- Super high speed backbones (Network Access Points)
  - Owned by National Science Foundation (NFS) until 1991
  - Taken over by ATT, Sprint, and MCI
- Domain names managed by US government until Fall 2015
- Currently managed by US Government under the Internet Corporation for Assigned Names and Numbers (ICANN)
- Will become an "International Group" that manages ICANN.

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# Structures in Computing: Internet Structure

- Over 2 billion nodes
- Most current map of node activity over a 24 hour period:  
<http://internetcensus2012.bitbucket.org/images/geovideo.gif>
- No one owns the Internet.
- The Internet cannot be destroyed.
- Google estimates over 100 trillion words on the Internet:  
Approximately 13 million bibles (King James version of Old and New testaments) or 17 million Torahs (all six books).
- United States has four main 'trunks' of the Internet called Metropolitan Area Exchanges (MAE)
- MAE-East, MAE-Central-North, MAE-Central-South, MAE-West

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# Structures in Computing: Internet Communication

- Protocol – agreement to use a standard exchange of information and the process of exchange.
  - TCP/IP
  - HTTP
  - FTP
  - SNMP
  - Etc.
- IP Address (The connection to the Internet.)
  - Static (Expensive to obtain)
  - Dynamic (Different each time you connect.)
- Domain name – easy way to find resources on the Internet

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# Structures in Computing: Internet Communication

- Protocol – agreement to use a standard exchange of information and the process of exchange.
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- IP Address
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# Structures in Computing: Internet Speed

Time it takes to go from your computer to a website and back is "latency."

- Upstream – The amount of time it takes to upload anything to an Internet destination. (YouTube, Twitter, FaceBook, etc.)
- Downstream – The amount of time it takes to download anything from an Internet source.
- Bandwidth the average speed in which you are able to upload/download. Rarely is it ever the same for both. Mostly, Downstream is much faster.
- <http://www.speedtest.net>

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# Structures in Computing: Internet Access

- Stationary Access
  - Dial up (measured in bits per second Bps)
  - DSL (Digital Subscriber Line)
  - Broadband
  - Satellite
  - WiMax (Community Wireless)
- Portable Access
  - WiFi Hotspot
  - Cellular Data Service

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# Structures in Computing: Internet Services

- Web (Surfing, searching, research, personalization -webpage)
- Email (Downloaded, web accessed only)
- Media (streaming movies, music, gaming)
- Voice/Image (Voice over IP -VOIP, full video phone calling)
- Conferencing (Collaboration between 2 or more nodes.)
- Finance (online banking, BitCoin, virtual money)
- Medical (Patient results, Pharmacy services)
- Social (Too many to list here...)

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# Structures in Computing: Internet Security

- HTTPS (Secured Socket Layers -used in shopping carts, online finance, document upload.)
- Digital Certificates (Issued from an "authority" e.g., Versign)  
<http://www.digicert.com/ppg/ssl-explained.htm?gclid=CKaCst6On70CFenm7Aod6noAxA>
- Public/Private Key Encryption
- Passwords are on everything!
  - How to manage?
  - How often to change?
- Homework Assignment: Bluetooth security inside your car?

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# Resources

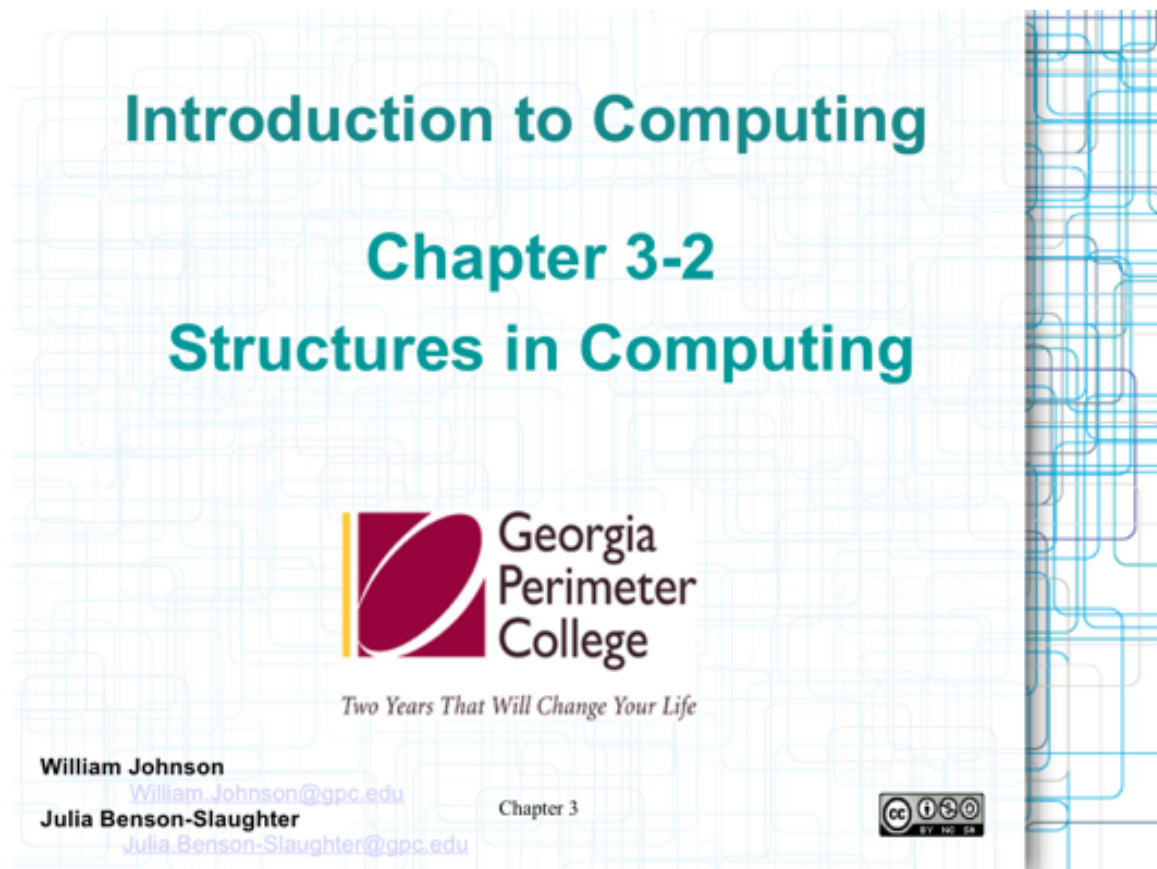
- [http://compnetworking.about.com/cs/internetworking/g/bldef\\_bridge.htm](http://compnetworking.about.com/cs/internetworking/g/bldef_bridge.htm)
- [http://compnetworking.about.com/cs/internetworking/g/bldef\\_repeater.htm](http://compnetworking.about.com/cs/internetworking/g/bldef_repeater.htm)
- [http://compnetworking.about.com/od/hardwarenetworkgear/g/bldef\\_switch.htm](http://compnetworking.about.com/od/hardwarenetworkgear/g/bldef_switch.htm)
- <http://www.columbia.edu/~hauben/CS/arpnet-encyc.txt>
- [http://www.computerhistory.org/internet\\_history/full\\_size\\_images/1969\\_4-node\\_map.gif](http://www.computerhistory.org/internet_history/full_size_images/1969_4-node_map.gif)

Chapter-3-2

## CSC1010 – Introduction To Computing

### Chapter 3-2

#### Structures in Computing.



This chapter covers computer networks. The various sizes and configurations are examined and we explore where they are used. Next, we discuss the Internet and its various aspects. The basics of the Internet, how it move information, and how it has changed our everyday life.

Then we discuss the Cloud. This topic reveals how the Cloud is structured, what factors are related to using it, and future possibilities. Lastly, we explore the new world of Socialnomics in computing.

## Structures in Computing: Cloud

- Data Storage and Organization
- Computer Processing
- Services for Business
- Services for Individuals
- Security and Encryption

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# Structures in Computing: Cloud

- Google Docs
- Microsoft One Drive
- Apple iCloud
- Box
- DropBox
- JustCloud
- Many, Many, Others
- <https://www.youtube.com/watch?v=QUtH8X7pejQ>
- <https://www.youtube.com/watch?v=RU8N-ggMT48>
- <http://youtu.be/HdX2VetFc6M>

Chapter 3

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# Structures in Computing: Cloud

- Scalable Computer Resources
  - Virtualized Server Machines
  - Online (cloud) Data Analytics
- Lower Cost of Ownership
- Highest Reliability = Highest \$ Cost
- Types:
  - Software as a Service (SAAS)
  - Platform as a Service (PAAS)
  - Infrastructure as a Service (IAAS)

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# Structures in Computing: Cloud

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# Structures in Computing: Cloud

- Platforms:

<http://searchcloudcomputing.techtarget.com/definition/Infrastructure-as-a-Service-IaaS>

<http://searchcloudcomputing.techtarget.com/definition/Platform-as-a-Service-PaaS>

<http://searchcloudcomputing.techtarget.com/definition/Software-as-a-Service>

- Security with Cloud

Services: <https://www.youtube.com/watch?v=Qx4JhSkIbJch>

<https://www.youtube.com/watch?v=WeG3esHW5cg>

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# Structures in Computing: Social-nomics

- What is it?

- [https://www.youtube.com/watch?v=t-JVXjGc\\_Aw](https://www.youtube.com/watch?v=t-JVXjGc_Aw)

- All forms of social media.
- Integration to marketing, healthcare, safety, etc.
- 7 Deadly Sins of Social Networking:

<http://www.csoonline.com/article/2124134/identity-theft-prevention/seven-deadly-sins-of-social-networking-security.html>

Chapter 3

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# Structures in Computing: Social-nomics

- Networking
  - Facebook, Google+, LinkedIn, Twitter
- Content Sharing
  - Pinterest, Facebook, Box, Google Docs, Snap-Chat, Tumblr, One Drive, iCloud
- Location-based Services
  - foursquare, Google Latitude, Facebook, Gowalla

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# Structures in Computing: Social-nomics

## Content Sharing Privacy:

- Before you post, ask the following:
  - Will this post/picture cause a problem for me?
  - Can I say this in front of my mother?
- Divide your Friends into groups, lists, or circles
  - Limit the number of people that see it
- Share public information with the public
- Share inner thoughts and personal feelings with close friends.

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# Structures in Computing: Social-nomics

## Networking Privacy:

- Do not Friend or Connect with people that you have not met in person or know well
- Reject Friend requests and Connections
- Having a lot of Friends works against you
  - Facebook may ask you to identify your Friends
- Limit your visibility on services

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# Structures in Computing: Social-nomics

Location and Privacy and Safety:

- Limit your check-in information to friends only
- Never check in at your home, school, work
- Avoid public lists for a location
- Do not let friends “check you in”
- Review all posts you are “tagged in”

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# Structures in Computing: Social-nomics

## General Safety Tips:

- Some sites will allow only a defined community of users (members only/registered users) to access posted content, while others allow anyone to view postings
- Consider restricting access to your personal page of information that you post (e.g., limit access to your family, friends, your team, a club, etc.).
- Don't post your full name, Social Security number, address, phone number, school name, exact age, etc.
- Your screen name should make you anonymous; don't use obvious information in your screen name such as your age, hometown, pet name, or part of your real name

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# Structures in Computing: Social-nomics

## General Safety Tips:

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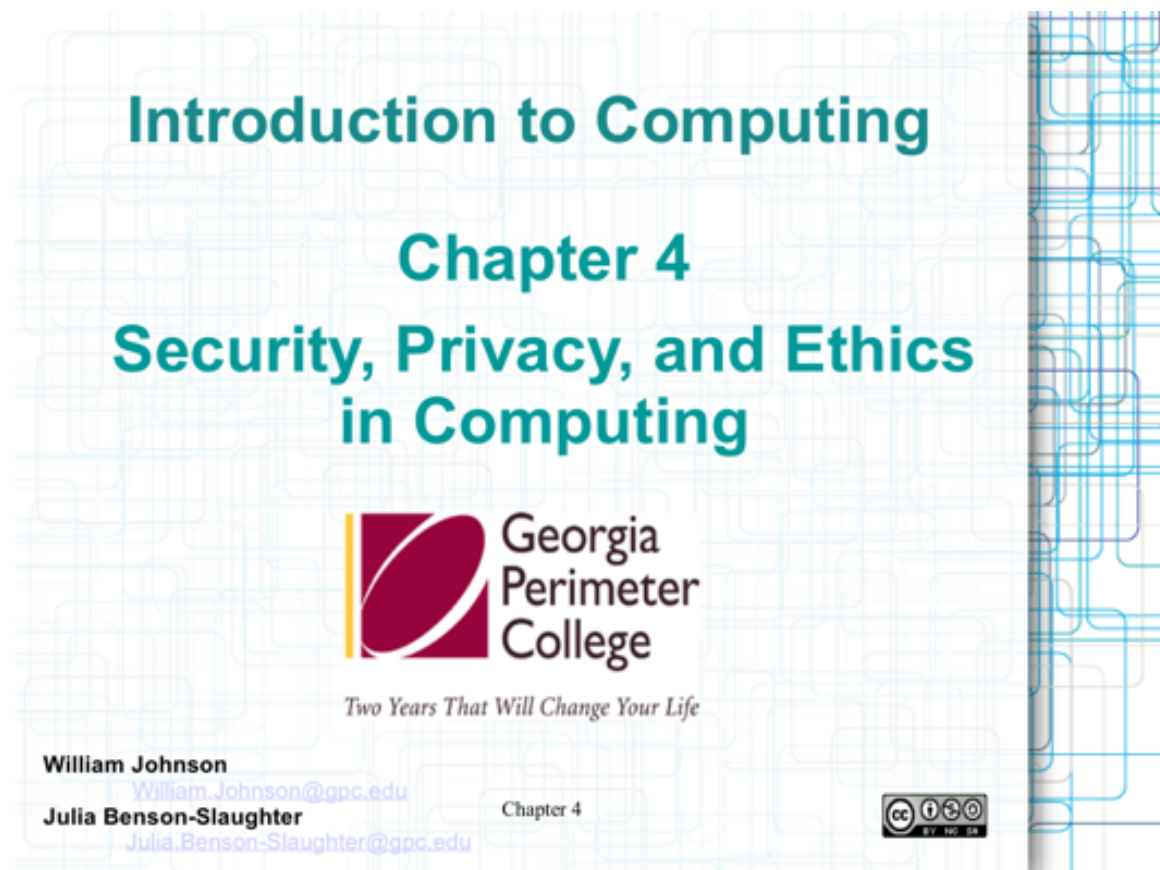
# Resources

- [http://compnetworking.about.com/cs/internetworking/g/bldef\\_bridge.htm](http://compnetworking.about.com/cs/internetworking/g/bldef_bridge.htm)
- [http://compnetworking.about.com/cs/internetworking/g/bldef\\_repeater.htm](http://compnetworking.about.com/cs/internetworking/g/bldef_repeater.htm)
- [http://compnetworking.about.com/od/hardwarenetworkgear/g/bldef\\_switch.htm](http://compnetworking.about.com/od/hardwarenetworkgear/g/bldef_switch.htm)
- <http://www.columbia.edu/~hauben/CS/arpnet-encyc.txt>
- [http://www.computerhistory.org/internet\\_history/full\\_size\\_images/1969\\_4-node\\_map.gif](http://www.computerhistory.org/internet_history/full_size_images/1969_4-node_map.gif)
- [Http://www.ncpc.org](http://www.ncpc.org)

CSC1010-Chapter-4

## CSC1010 – Introduction to Computing

### Security, Privacy, and Ethics in Computing



# Chapter 4

## Security, Privacy, and Ethics in Computing

- Backup of Data
- Privacy
- Encryption
- Ethics: do you share your media?

# Chapter 4

## Security, Privacy, and Ethics in Computing

- Backup of Data
- Privacy
- Encryption
- Ethics: do you share your media?

# Security, Privacy, and Ethics in Computing

- **Backup of Data**
- Privacy
- Encryption
- Ethics: do you share your media?

Chapter 4

**Backup**

**Privacy**

**Encryption**

**Ethics**

# Security, Privacy, and Ethics in Computing

## Security = Backup

- Backup types:
  - File Copies
  - Synchronization
  - Windows Backup
  - Backup Software
  - Virtual Machines
  - Tablets and Smartphones

Chapter 4

**Backup**

**Privacy**

**Encryption**

**Ethics**

# Security, Privacy, and Ethics in Computing

## Security = Backup

- Some ground rules:
  - Backup stores files that are needed when something has destroyed or infected an original one.
  - Scheduling a backup means you run a risk of losing work in between when backup is performed.
  - Verify the backup works by restoring a file.
  - How valuable is your data?
    - Invest accordingly for your data to ensure it's safety.
    - Consider Online backup solutions.

Chapter 4

**Backup**

**Privacy**

**Encryption**

**Ethics**

# Security, Privacy, and Ethics in Computing

- **File Copies:**

- Consider a copy burned to a DVD.
- Consider an external hard drive and simply copy all files to it.
- Can be timely due to finding a particular file and copying the good one over the bad one.

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# Security, Privacy, and Ethics in Computing

- **Synchronization:**

- Compares two files to ensure they are the same in the two locations.
- Usually occurs on a scheduled basis, or when a change happens (on demand)

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# Security, Privacy, and Ethics in Computing

- **Windows Backup:**

- Included with Windows 8 "File History"
- Can create a "full" backup
  - A copy of every file on the computer's hard disk.
- Can create a "Boot" disk
  - Contains minimum data to get the computer up and running.
  - Does not need a hard disk in place to work.
- Can create a "Recovery" disk
  - Will allow the computer to get up and running, but it has every file as when you first got the computer.
  - This option erases ALL your documents and files and restores the computer back to an original state.

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**Backup**

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# Security, Privacy, and Ethics in Computing

- **Windows Backup (cont):**

- Some computers have a "recovery partition" that allows you to start the device in an original state, then restore or recover files.
- A restore point – used as a snapshot of your system: files, memory, registry, etc.
- The Registry from Windows allows the system to communicate to all the hardware and software installed on the computer. (Device drivers, installation information, etc.)

Chapter 4

**Backup**

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# Security, Privacy, and Ethics in Computing

- **Backup Software:**

- This is a set of utilities that can backup and restore the files for you.
- Full backup
  - Copy of all files on the device are put in a "backup file"
- Differential backup
  - Only copy of "changed" files since last last "FULL" backup.
- Incremental backup
  - Only copy of "changed" files since last "ANY" backup, full, differential or incremental.

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**Backup**

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# Security, Privacy, and Ethics in Computing

- **Backup Software:**

- Restoring files to a computer takes numerous steps and processing.
- "Bare metal" restore means putting the computer back to its original state.
- "Disk Image" is a bit by bit copy of an entire computer's disk files and state.

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# Security, Privacy, and Ethics in Computing

- **Virtual Machines:**

- Keeps a version of your files on a more secured, backed up machine.
- Creates an emulation of Windows that runs inside another computer, so all files are in constant backup status.
- Let's you restore (or start over) with a new computer by initializing the virtual machine back to the original state.

Chapter 4

**Backup**

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# Security, Privacy, and Ethics in Computing

- **Tablets and Smartphones:**

- Synchronize the device to a computer by way of a "tethered" connection using a wire, bluetooth, or Wi-Fi.
- Apple devices are automatically synched upon connecting.
- Android devices require another software program to initiate backup actions.

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# Security, Privacy, and Ethics in Computing

- Backup of Data
- **Privacy**
- Encryption
- Ethics: do you share your media?

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# Security, Privacy, and Ethics in Computing

- **Privacy:**

- Intrusion Attempts
- Securing IP Ports
- NAT (network address translation)
- Virtual Private Networks

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# Security, Privacy, and Ethics in Computing

- **Privacy:**

- Intrusion Attempts

- Any access to your computer data by a hacker, criminal, or any unauthorized person.
    - Communication ports allow the intruder to enter your computer.
    - Automated probing of ports (a scan on your router) allows criminals to find unprotected ports and enter your computer.
    - Windows has a built in firewall to prevent intrusion from happening

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# Security, Privacy, and Ethics in Computing

- **Privacy:**

- Securing Ports

- A firewall is software that is running on your computer and/or in the router you use.
    - If you share devices over the Internet, you must “open” port numbers to allow access to those things (printers, hard drives, photo printer, etc.).

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# Security, Privacy, and Ethics in Computing

- **Privacy:**

- Network Address Translation (NAT)
  - Software that runs on your router that ensures IP packets keep their private or public Internet addresses
  - NAT means IP packets are routable from one direct device to another over the Internet.
  - Private IP packets do not cross outside to the Internet, must use VPN.

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# Security, Privacy, and Ethics in Computing

- **Privacy:**

- Virtual Private Network (VPN)
  - A connection that allows private IP packets to be routed to external systems, but very securely.
  - VPN connections are only know between parties using the connection, not made public, not ever.
  - VPN connections are like pipes in a large building where each tenant gets their own water from the main source by way of their individual pipes.

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# Security, Privacy, and Ethics in Computing

- Backup of Data
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- **Encryption**
- Ethics: do you share your media?

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# Security, Privacy, and Ethics in Computing

- **Encryption:**

- <http://computer.howstuffworks.com/encryption.htm>
- <http://www.lifehacker.com.au/2012/04/encryption-101-understanding-the-basics/>
- Internet connections use a secured sockets layer (SSL) protocol to ensure encryption.
- Web surfing uses HTTPS to encrypt communications from a web page to a web browser
- Email can use a digital certificate to "sign" a message.
  - Sender uses a private digital certification
  - Receiver uses the sender's public digital certification to authenticate and read contents

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# Security, Privacy, and Ethics in Computing

- Backup of Data
- Privacy
- Encryption
- **Ethics: do you share your media?**

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# Security, Privacy, and Ethics in Computing

- **Ethics:**

- Study of Standards of right and wrong related to computer hardware, software, copyrights, patents, licensing.
- Do not copy another's work (software).
- Do not copy someone's "licensed" software like Microsoft Office.
- Do not plagiarize from another's publication.

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# Security, Privacy, and Ethics in Computing

- **Ethics:**

- Piracy:

- Copying another's software, videos, or music and using it like you purchased it.
- Buying "pirated" software and using it like a valid licensed version

- Licensing

- Single user: One user, one copy, on a single machine.
- Multi user: Usually a "site" license that allows to be installed on several computers
- Concurrent user: Set number of users for "current" usage. Usually installed on a server and when limit is reached, user is denied access to software.

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# Security, Privacy, and Ethics in Computing

- **Ethics:**

- Licensing (cont)

- Site License: granted access to install on every machine at one location (company, or school)

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# Security, Privacy, and Ethics in Computing

- **Ethics:**

- Types of Software

- Open Source: Free to change the source, give away, copy anywhere – no licensing.
- Freeware: Free to use, copy anywhere, give away, but not change -licensed under some type of organization.
- Shareware: Trial version to use for a time then a small fee is required to buy a licensed version. Usually has features limited until fee is paid.
- Commercial: Purchased, not free, and licensed for a type of licensing mentioned earlier.

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# Chapter 4

## Security, Privacy, and Ethics in Computing

### **Resources:**

- <http://searchfiletype.com/Dr-Seals-Computer-Ethics-COMP4730-fs14685.html>